

TECHNICAL MEMORANDUM

To: Nevada Environmental Response Trust

Cc: Dan Pastor, Tetra Tech, Inc.

From: April Hussey and Katie Hendrickson

Date: September 18, 2018

Subject: Operation and Maintenance Summary – August 2018
Weir Dewatering Treatment Plant
Nevada Environmental Response Trust; Henderson, Nevada

The Southern Nevada Water Authority (SNWA) has completed the dewatering portion of two weir construction projects in the Las Vegas Wash, the Sunrise Mountain Weir and Historic Lateral Weir. SNWA hired a construction company, Las Vegas Paving (LVP) to perform weir construction activities. Activities included constructing diversion channels to divert the Las Vegas Wash and perform construction dewatering activities. The Nevada Environmental Response Trust (NERT or Trust) was ordered by the Nevada Division of Environmental Protection (NDEP) to treat the groundwater from the construction dewatering activities to remove perchlorate before discharging the treated water to the Las Vegas Wash.

Tetra Tech, Inc. (Tetra Tech) designed and constructed two pump stations and a central water treatment plant (CWTP), collectively referred to as the SNWA Weir Dewatering Treatment Plant (Treatment Plant) to manage and treat groundwater from the construction activities. The Treatment Plant operated on a temporary basis, and full operations ceased on August 23, 2018 after groundwater dewatering associated with the SNWA weir construction projects was complete. Decommissioning of the Treatment Plant began in late August 2018.

At the direction of NERT, Tetra Tech has prepared this summary of the operation and maintenance (O&M) activities performed during August 2018 for the Treatment Plant. The system was operated and maintained in accordance with the *NERT – SNWA Weir Dewatering Water Treatment Plant Operation and Maintenance Manual*.

SUMMARY OF O&M ACTIVITIES

The Treatment Plant continued to receive water from weir construction dewatering activities at Sunrise Mountain Weir until August 14, 2018. On August 14, 2018 at approximately 7:00 am, Sunrise Mountain Pump Station (SMPS) was placed in standby mode following Las Vegas Paving's completion of dewatering activities at Sunrise Mountain Weir. On August 23, 2018, SNWA provided notice to the Trust that no additional dewatering activities were planned for the Sunrise Mountain Weir construction site and the SMPS and CWTP were cleared for decommissioning.

OPERATIONS

Operations in August 2018 were characterized by three distinct phases:

1. Treatment of influent water from Sunrise Mountain Weir construction site (August 1 – 14): This phase was characterized by intervals of high influent total suspended solids (TSS) as a result of LVP construction activities disturbing soils in or near dewatering trenches at the Sunrise Mountain Weir construction site, particularly as they filled in trenches in preparation for dewatering completion. Short intervals of high influent TSS were also observed as a result of sizeable weather events.
2. Treatment Plant standby period (August 14 – 23): This phase was characterized by recirculation of flows in the Treatment Plant to maintain plant operability to support potential resumption of dewatering activities from Sunrise Mountain Weir construction site.
3. Decommissioning support (August 23 – 31): This phase was characterized by recirculation of flows in the Treatment Plant to maintain plant operability to support resumption of treatment and discharge as needed to support Historic Lateral Pump Station (HLPS), SMPS, and CWTP decommissioning, and intermittent treatment and discharge of flows associated with decommissioning.

Treatment Plant National Pollutant Discharge Elimination System (NPDES) water quality samples and influent flowrate monitoring confirmed the operations were in compliance with permit limits during the August 2018 reporting period.

Flow Rates

Flow rates for August 2018 are summarized in Table 1. This includes a summary of the flow rate into the HLPS (zero flow for the month), into the SMPS, and out of the Treatment Plant.

Historic Lateral Pump Station

During August 2018, HLPS did not receive water from the Historic Lateral Weir construction site. In late August, in support of HLPS decommissioning activities, approximately 24,000 gallons of water was pumped from the HLPS influent tanks to the CWTP. This water had been stored in the HLPS influent tanks since June 4, 2018 to maintain HLPS equipment operability to support decommissioning. As with the flows from HLPS to CWTP noted above, planned future flows that are pumped to the plant will be recorded in future monthly reports and on the NPDES Discharge Monitoring Reports.

Sunrise Mountain Pump Station

From August 1, 2018 through August 14, 2018 flow rates into the SMPS decreased fairly consistently, reflecting the tapering of dewatering operations by LVP at the Sunrise Mountain Weir construction site as dewatering activities neared completion. As noted above, SMPS was placed in standby mode on August 14, 2018 and cleared for decommissioning on August 23, 2018. After August 14, 2018, SMPS did not receive water from the Sunrise Mountain Weir construction site. No activities associated with the decommissioning of the SMPS, other than recirculation of flows as noted above, occurred during this reporting period.

Central Water Treatment Plant

From August 1, 2018 through August 14, 2018, discharges from the CWTP correlated with the influent flows from the Sunrise Mountain Weir dewatering construction site. After August 24, 2018, intermittent discharges occurred associated with treatment and discharge of flows associated with decommissioning activities. Discharge volumes may vary slightly from influent flows associated with decommissioning due to changes in the volume of water stored in the CWTP to support plant recirculation with each pumping event.

Influent Parameters

Influent water quality parameters are measured daily for the water coming into each pump station. Note that influent flows have ceased and future monthly reports will not include this discussion of influent parameters.

Influent water quality parameters measured in August 2018 include:

- Perchlorate
- Chlorate
- Total Dissolved Solids (TDS)
- Sulfate
- Nitrate

Perchlorate, chlorate, and TDS are analyzed at a certified laboratory (Test America) in accordance with the Operations and Maintenance Agreement, executed December 31, 2017. Sulfate and nitrate are also analyzed to capture a complete evaluation of these influent parameters. Beginning March 16, 2018, both nitrate and sulfate were analyzed exclusively by the in-house laboratory. Both nitrate and sulfate are analyzed according to EPA method 300.0. These in-house procedures meet the standards specified in the approved NERT project Quality Assurance Project Plan as described in previous monthly reports.

The range and average of perchlorate concentrations observed into each pump station during the reporting period were:

- HLPS: no flow received
- SMPS: 685 to 1,140 µg/L, average: 972 µg/L

Table 2 contains the summary data from the daily influent parameter measurements.

Perchlorate Mass Removal Estimates

Daily perchlorate mass removal estimates were calculated from the recorded total influent flow to the SMPS and HLPS and daily measurements of perchlorate (analyzed at Test America by Method 314.0). Since influent flows from dewatering activities have ceased, future monthly reports will not include this discussion of perchlorate mass removal estimates. The mass removed was calculated based on an effluent perchlorate concentration of zero (0) µg/L. The estimated mass of perchlorate removed during August 2018 is:

- HLPS: 0 pounds
- SMPS: 207 pounds
- Total: 207 pounds

Perchlorate removal estimates have been tabulated since the startup period ended January 17, 2018. The estimated total perchlorate mass removed from January 18, 2018 through August 31, 2018 is:

- HLPS: 387 pounds
- SMPS: 5,623 pounds
- Total: 6,010 pounds

A graph showing the estimated removal of perchlorate from January 18 through August 31, 2018 is presented in the attached Figure 1.

Suspended Solids Removal and Management

The Treatment Plant was designed to remove the majority of suspended solids from the influent waters via hydrocyclones and multimedia filters (MMF). High TSS waste from the hydrocyclones are stored in the 20,000-gallon cyclone waste tank. High TSS waste from the MMFs is generated during the MMF backwash process and

is stored in two 20,000-gallon backwash waste tanks. The system is designed to slowly blend in backwash waste and cyclone waste water into the treated effluent stream in small quantities to ensure the concentrations do not exceed the NPDES permit discharge limits for perchlorate (18 µg/L) and TSS (135 mg/L).

To address the ongoing significant solids loading in the waters produced from weir construction, continued use of external tanks for cyclone and backwash waste surge and storage capacity and associated decanting system occurred in August 2018. These external surge tanks are connected to the permanent cyclone and backwash waste tanks with a semi-permanent hard-pipe system to reduce the potential for releases outside of containment. The piping system maintains all pumps and connections within secondary containment and includes a pumping circuit to decant the water overlying settled solids from these tanks back into the SMPS influent tanks. In the month of August:

- No tanker truckloads of solids slurry were sent to the landfill, or 0 gallons of tanker capacity; and
- 1,469,200 gallons of water overlying settled solids were decanted from the surge tanks and routed back through the Treatment Plant (5,935,700 total gallons since start of decanting process).

MAINTENANCE

Maintenance performed at the Treatment Plant during the reporting period included both routine maintenance activities and non-routine maintenance activities as described in the following sections.

Routine Maintenance

Routine maintenance activities included the following:

- Generators supplying power to the SMPS, HLPS, and CWTP require service approximately every 250 hours of generator run time. Generators were serviced during the reporting period as follows:
 - XQ500 – Unit 14-165 (at CWTP), service conducted on August 9 and 24, 2018.
 - XQ350 – Unit 17-248 (at SMPS), service conducted on August 21, 2018.
 - XQ350 – Unit 17-250 (at SMPS), service conducted on August 9 and 21, 2018.
 - XQ350 – Unit 17-251 (at SMPS), service conducted on August 7 and 23, 2018.
 - 20 kW generator (16-052) running lights at HLPS was conducted on August 30, 2018
- Wye strainer was flushed periodically to clear solids accumulation.
- Cyclone underflow lines were flushed periodically to clear solids accumulation.
- Cyclone valves were greased.
- Tank level sensors were cleaned.

Non-Routine Maintenance

Non-routine maintenance was performed during August 2018 to improve Treatment Plant operation, including:

- Installed new flowmeter at Ion Exchange C train on August 1, 2018.
- Repaired Cyclone Waste Pump PU4A with new mechanical seal, seal housing bushing, new gaskets in check valve, and brought back online August 7, 2018.

O&M Costs

At the direction of the Trust, Tetra Tech has summarized cost data for the reporting period. The following table summarizes project charges in accordance with the Operations and Maintenance Agreement, executed December 31, 2017. This section only captures project charges consistent with the O&M agreement or agreed

upon charges for items supplied by/through Tetra Tech and billed to the Trust. Costs associated with third-party contractor decommissioning activities and Tetra Tech oversight of the same are not included in this summary.

Table 3: O&M Cost Summary

Item	Payment Details	Unit ¹	Cost Invoiced During Reporting Period	Total Costs – Project Inception to Date
Monthly Base Cost	Lump sum payable to Tetra Tech	\$297,500 /month	\$297,500	\$2,380,000
Ion Exchange Resin	Lump sum direct pay from Trust to Evoqua for turn key resin delivery, replacement, transportation and disposal services	\$135,755 /vessel which includes: \$109,750 /vessel for resin \$26,005 /vessel for changeout services and disposal	\$170,814 ²	\$813,282
Tankage	Actual usage charges direct pay from Trust to vendor	<u>Baker Corp:</u> \$20,074 /month plus variable maintenance fees as necessary <u>Rain for Rent:</u> Variable costs	\$0 ³ \$19,515	\$229,549
Generator Rental / Maintenance	Actual usage charges direct pay from Trust to Cashman	<u>Rental:</u> varies based on hours of run time and generator size. <u>Maintenance:</u> \$625 every 250 run hours per XQ350 Generator \$1,250 every 250 run hours per XQ500 plus Backup generator rental costs as required to support maintenance	\$98,152 ⁴ \$15,625	\$155,652
Generator Fuel	Actual usage charges direct pay	Adjusts per market	\$146,865	\$710,591

¹ Unit rates do not include applicable taxes.

² The equivalent of 9 vessel changeouts were paid by the Trust as part of the construction contract. This credit has been exhausted. These charges reflect additional vessel changeouts payable directly by the Trust.

³ The Trust pre-paid a sum during Treatment Plant Construction for project tankage to obtain a discount on long-term equipment cost. As of August 31, 2018, the remaining credit balance is \$16,269.64. Additional payment by the Trust will not be required until this prepayment credit is exhausted.

⁴ The Trust pre-paid a sum during Treatment Plant Construction for generator rental to obtain a discount on long-term equipment cost. This credit has been exhausted. Additional costs will be payable directly by the Trust.

Item	Payment Details	Unit ¹	Cost Invoiced During Reporting Period	Total Costs – Project Inception to Date
	from Trust to Cashman			
Solids Disposal	Lump sum payable to Tetra Tech for off-site transportation and disposal	\$4,150 /3,000-gallon tanker \$6,917 /5,000-gallon tanker	\$8,300	\$1,517,579
Decanting	Daily charge payable to Tetra Tech	\$10,000 /day	\$0	\$400,000
Repairs	Cost of Equipment replacement plus 5% markup payable to Tetra Tech	Adjusts per need	\$0	\$14,073
TOTAL			\$756,771	\$6,220,726

No other items were supplied by/through Tetra Tech and billed to the Trust during this reporting period.

CERTIFICATION

I hereby certify that I am responsible for the services described in this document and for the preparation of this document. The services described in this document have been prepared in a manner consistent with the current standards of the profession, and to the best of my knowledge, comply with all applicable federal, state, and local statutes, regulations, and ordinances. I hereby certify that all laboratory analytical data was generated by a laboratory certified by the NDEP for each constituent and media presented herein.

Description of Services Provided: Prepared Weir Dewatering Treatment Plant Operation and Maintenance Summary for August 2018.



Kyle Hansen, CEM
Field Operations Manager/Geologist
Tetra Tech, Inc.

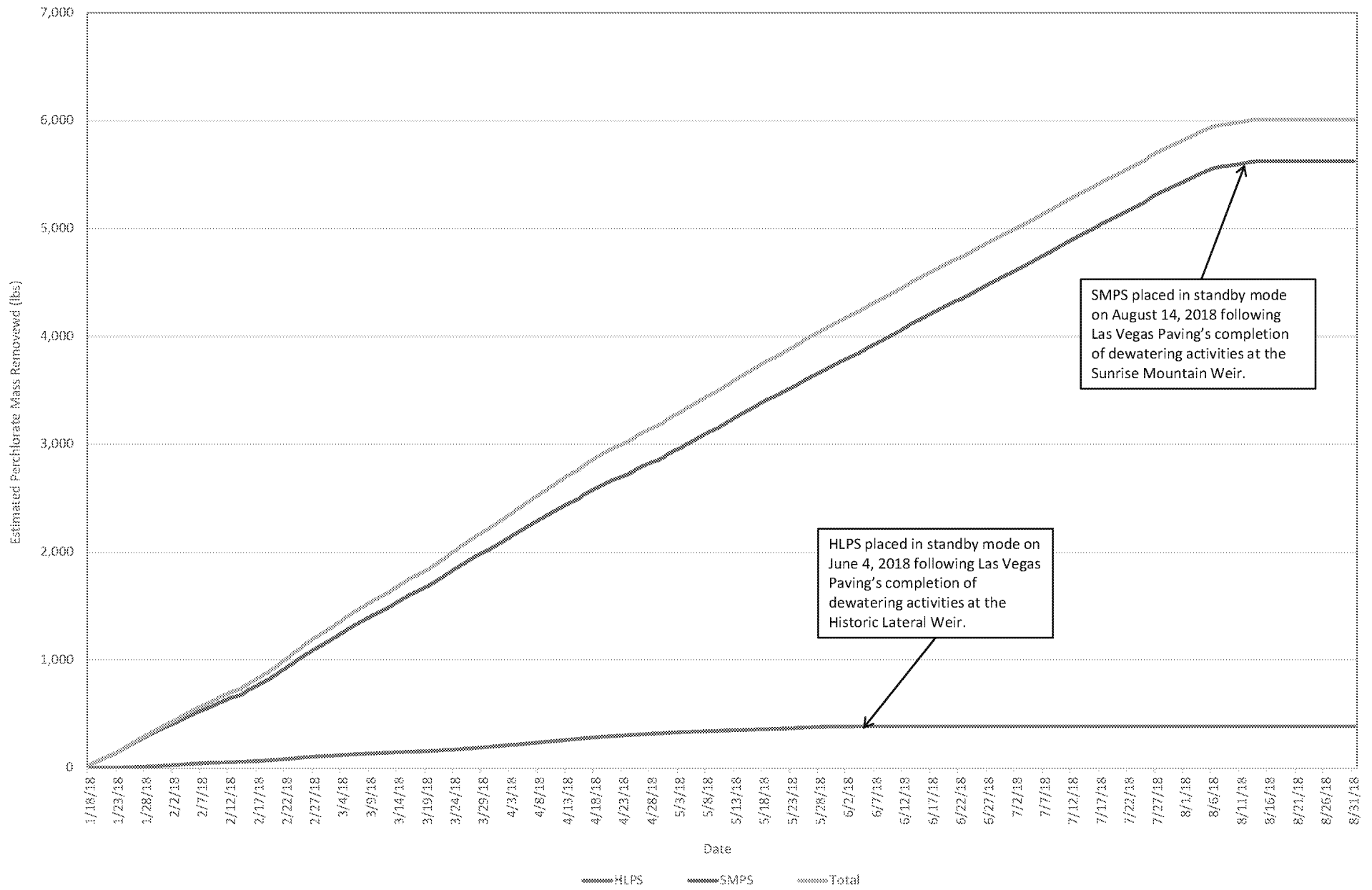
September 18, 2018

Date

Nevada CEM Certificate Number: 2167
Nevada CEM Expiration Date: September 18, 2020

Figures

Figure 1
Estimated Perchlorate Mass Removed January 18 - August 31, 2018



Tables

Weir Dewatering Treatment Plant
Monthly Flow Summary
August 2018
Table 1

Date	Influent						Effluent ³	
	HLPS		SMPS		Combined Flow ¹			
	Average ² (FIT3010) gpm	Total (FIT3010) Gallons	Average ² (FIT2010) gpm	Total (FIT2010) Gallons	Average ² (FIT4010) gpm	Total (FIT4010) Gallons	Average ² (FIT8060) gpm	Total (FIT8060) Gallons
8/1/2018	0	0	2,118	3,049,600	2,119	3,050,800	2,185	3,146,400
8/2/2018	0	0	2,026	2,917,500	2,042	2,940,100	2,084	3,000,400
8/3/2018	0	0	1,992	2,868,700	2,023	2,912,500	2,019	2,907,900
8/4/2018	0	0	2,014	2,899,800	2,009	2,893,600	2,082	2,997,600
8/5/2018	0	0	1,942	2,795,800	1,929	2,777,200	1,984	2,856,400
8/6/2018	0	0	1,828	2,632,000	1,800	2,592,200	1,844	2,655,100
8/7/2018	0	0	900	1,296,500	961	1,384,500	912	1,312,700
8/8/2018	0	0	617	888,200	700	1,008,700	625	899,500
8/9/2018	0	0	692	997,100	775	1,116,300	697	1,004,100
8/10/2018	0	0	734	1,056,600	813	1,171,400	730	1,051,900
8/11/2018	0	0	757	1,090,200	813	1,170,900	733	1,055,200
8/12/2018	0	0	799	1,151,200	879	1,265,800	764	1,100,700
8/13/2018	0	0	797	1,147,200	891	1,282,900	735	1,059,100
8/14/2018	0	0	233	335,900	644	927,700	557	802,300
8/15/2018	0	0	0	0	0	0	0	0
8/16/2018	0	0	0	0	0	0	0	0
8/17/2018	0	0	0	0	0	0	0	0
8/18/2018	0	0	0	0	0	0	0	0
8/19/2018	0	0	0	0	0	0	0	0
8/20/2018	0	0	0	0	0	0	0	0
8/21/2018	0	0	0	0	0	0	0	0
8/22/2018	0	0	0	0	0	0	0	0
8/23/2018	0	0	0	0	0	0	0	0
8/24/2018	0	0	0	0	0	0	0	0
8/25/2018	0	0	0	0	0	0	0	0
8/26/2018	0	0	0	0	0	0	0	0
8/27/2018	0	0	0	0	0	0	0	0
8/28/2018	0	0	0	0	17	24,400	16	23,000
8/29/2018	0	0	0	0	0	0	0	0
8/30/2018	0	0	0	0	0	0	0	0
8/31/2018	0	0	0	0	0	0	0	0

Notes:

HLPS = Historic Lateral Pump Station.

SMPS = Sunrise Mountain Pump Station.

FIT numbers presented in column headers correlate with Flow Instrument Transmitter tag numbers for particular flow meters.

Combined flow totals recorded on 8/2 - 8/3, and 8/7 - 8/14 inclusive of recirculated flow through plant decant process.

Flows recirculated internally in plant 8/15 - 8/31. Flow volumes not recorded on this summary table as no influent or effluent flows occurred, except as noted on 8/28/18.

8/28/2018: Values for Combined Flow and Effluent reflect pumping of water stored in HLPS influent tanks to the treatment plant and discharge of treated water. These activities were performed to support HLPS decommissioning operations and to retain proper water volumes within CWTP system to support ongoing recirculation operations.

1 - The combined feed is measured by flow indicator FIT4010. This is not equal to the sum of flows from HLPS (FIT3010) and SMPS (FIT2010) due to fluctuating volumes in influent storage tanks.

2 - Average calculated by dividing total gallons by 1,440 (minutes per 24 hours).

3 - Effluent flow meter data is higher than the combined influent flows due to inherent flowmeter variability and is compounded by batch processing operations. Air drawn into piping (as designed for vacuum breaks) at the end of each pumping batch has been observed to result in transient, short duration high flow readings that are not representative of actual flows.

Weir Dewatering Treatment Plant
Influent Parameter Summary
August 2018
Table 2

Parameter:			Perchlorate		Chlorate		Total Dissolved Solids		Nitrate as NO3		Sulfate		
Units:			ug/L		ug/L		mg/L		mg/L		mg/L		
Location	Collection Date	Lab Sample ID	Result	LQ	Result	LQ	Result	LQ	Result	LQ	Result	LQ	Comment
SMPS Influent	8/1/2018	440-217144-1	1020		185		2670		24.8		1150		
	8/2/2018	440-217190-1	976		189		2700		25.0		1150		
	8/3/2018	440-217340-1	1100		191		2850		25.3		1140		
	8/4/2018	440-217545-1	997		240		2910		24.6		1130		
	8/5/2018	440-217547-1	893		200		2980		24.2		1240		
	8/6/2018	440-217543-1	1010		223		3020		25.3		1250		
	8/7/2018	440-217619-1	1140		237		3050		24.1		1240		
	8/8/2018	440-217658-1	685		21.4	J	2520		44.2		930		
	8/9/2018	440-217882-1	872		69.9		2760		42.5		1100		
	8/10/2018	440-217951-1	969		163		2740		38.8		1130		
	8/11/2018	440-218043-1	1000		97.5		2820		34.5		1090		
	8/12/2018	440-218041-1	984		93.7		3010		36.5		1200		
	8/13/2018	440-218044-1	958		97.7		3050		31.7		1220		
	8/14/2018	440-218114-1	1010		113		2910		30.2		1200		

Notes:

ug/L micrograms per liter (parts per billion)

mg/L milligrams per liter (parts per million)

HLPS Historic Lateral Pump Station

SMPS Sunrise Mountain Pump Station

J Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.

Nitrate data presented as NO₃ consistent with terms of O&M agreement.

Nitrate and sulfate analyzed exclusively by In-House Laboratory beginning 3/16/18.

HLPS placed in standby mode beginning 14:07 6/4/2018.

HLPS cleared for decommissioning 7/11/2018.

SMPS placed in standby mode beginning 06:51 8/14/2018.

SMPS and CWTP cleared for decommissioning 8/23/2018.